# NOTES ON THE AQUATIC HABITATS OF MACROHYDROPHYTES AND ASSOCIATED ALGAE IN VARIOUS REGIONS IN EGYPT I. EL-FAYUM REGION

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### INTRODUCTION

El-Fayum region is situated on the left bank of the Nile about 90 kilometer to the south west of Cairo. Lake Qarun lies in the north west of this region. The cultivated lands are naturally irrigated by a number of canals derived from Bahr-Yossef River, which receives its water from the Nile. The irrigation-water drains off into the lake by two main drains.

Earlier works on the algae of El-Fayum (see Aleem, 1958; El-Saadawi et al., 1978; Nosseir and Abou-El-Kheir, 1970; Shaaban et al., 1985; West, 1909)were mainly concerned with the distribution of the extinct and extant algal floras, the effect of nutrients on production...etc.

However, little is known of the relationship between algae and macrohydrophytes in Egypt; the only two publications dealing with this subject were done on lake Mariut (Kaleafah, 1964) and the Mansoura-Damietta area (Ayyad, 1980). Kaleafah,(1964) studied the ecology of algae in lake Mariut and found that Enteromorpha, Rhizoclonium, Oedogonium and Cladophora were epiphytic on Pharagmites communis, Potamogeton pectinatus and Typha latifolia. While Ayyad (1980), working on water bodies in the Mansoura-Damietta area, observed that Synedra ulna var. ulna, S. ulna var amphirhynchus, Achnanthes hungarica, A. lanceolata, Cocconeis placentula var. euglypta, C. placentula var. intermedia, Phinnularia microstaurn var. brebissonii, Nitzschia amphibia, N. thermalis, Bacillaria paradoxa, Amphora veneta, and Gomphonema angustatum var. productum from class Pinnatophyceae and only Cyclotella ocellata from class Centrophyceae were found on the surface of Ceratophyllum demersum, Potamogeton crispus, Pistia stratiotes, Nymphea lotus and Lemna gibba.

Prowse (1959) stated that little is known about the relationship of epiphytes with their hostplants, or more particularly, whether certain species of algal epiphytes are associated with species of macrophytes. Sheldon and Charles (1975) recorded that diatoms were the dominant population of epiphytic algae in oligotrophic lake. Ewinson (1978) noticed that the increase of nutrients increased the diatom epiphytes and decreased the aquatic hydrophytes.

Some work has been done on certain aspects of relationship between algae and other plants; algal hydrophyles, lichens and algamoss-associations (see for example; Fritsch, 1959; Chapman, 1964; Prescott, 1969; El-Saadawi and Abou-El Kheir, 1973; Richardson, 1981; Abou-El Kheir et al., 1986; and El-Saadawi et al., 1986).

The present investigation deals with association aspects between algae and macrophydrophytes in different water ecosystems including flowing and standing systems and a study of the possible effects of major physical and chemical factors upon their pattern of distribution.

### MATERIAL AND METHODS

Fifteen samples, used in this study, were taken from 12 sites in El-Fayum region. The samples were collected from irrigation canals, drains, springs and Lake Qarun.

Field ecological notes were recorded such as width and depth of the water channel, water cuurrent velocity, surface water temperature, and pH. Data concerning description of habitats, characters of the macrohydrophyte communities, the main associated algal flora in the 12 studied sites, and other details are presented in table 1.

Clearing of diatoms, identification of the algal taxa associated with the aquatic plants and determination of the various nutrients in the samples were made.

## **RESULTS AND OBSERVATIONS**

Data concerning water analysis of the 15 studied samples and algal flora identified in them are given in tables 2 and 3.

It has been noticed that, when the habitat was a narrow drain with nearly stagnant water, dominant macrophydrophytes were <u>Typha</u> <u>domin-</u> <u>gensis</u> and <u>Phragmites</u> <u>australis</u>, and were associated with <u>Oedogonium</u> <u>capilliformis</u> as dominant, with common occurrence of planktoner <u>Nitzschia</u> <u>frustulum</u> and the blue green alga <u>Mastigocladus laminosus</u>.

At an irrigation canal (Maymana canal), under open running water, was noted dominance of <u>cladophora</u> <u>glomerata</u> with epiphytic <u>Cocconeis</u> <u>placentula</u> var. <u>intermedia</u>.

At kaabi irrigation canal, the habitat offered a study of a striking change on the two sides of the little barrage present, with quiet water on one side, site 5a, and extremely fast-falling water from the water gates on the other side, site 5b, on the almost quiet water side dominated Potamogeton nodosus associated with the planktoner Cyclotella ocellata; while under the water fall, <u>Cladophora glomerata</u> dominated as epilithic to the barrage stones flooded with extremely fast flowing water. <u>Cladophora glomerata</u> extended as dominant in the fast flow in open water at distance from the barrage, site 5c.

A narrow drain, 5 km from El-Fayum city, with stagnant water completely covered with floating Lemna gibba fronds at surface and with Typha domingeusis at sides. This lentic water habitat showed association of Oedogonium capilliformis as dominant and Spirogyra varians and Achnanthes hungarica as common.

A water spring habitat is presented by Silene spring, site 8. The habitat represents a small channel with fast flowing open water and macrohydrophytes at bank sides. Examination has shown almost rare or lack of planktonic or benthic algal flora.

At sites 9-12, the habitat is the salty Qarun lake with <u>Phragmites</u> <u>ausitalis</u> dominating at this southern shoreside, associated with usually rare algal flora due to high salinity; only rare new records of salinity tolerant taxa were recorded.

## CONCLUDING REMARKS

Variation in algal taxa under the different studied habitats including fresh water of irrigation canals, field drains, spring water, salty lake water, has been noticed and this is dependent on various ecological factors of ecosystems: The association is brought about by similarity of ecological amplitude of certain aquatic plants and certain algae or dependence of one species of algae upon another of aquatic plants for epiphytism, protection, suitable light intensity, or formation of suitable microhabitat or substratum for the algae.

<u>Phragmites australis</u> has the widest ecological amplitude on all studied macrohydrophytes (see table 1). Since it is present in almost half the number of the sites. The diatoms dominate over other divisions of algae. The most common diatoms that occur in association with the studied hydrophytes are: <u>Cocconeis placentula</u> v. <u>intermedia, Achnanthes hungarica, Gomphonima gracile, Nitzschia frustulum</u> and <u>Cyclotella ocellata</u> Rivera (1973), Marker and Gunn (1977), Moor (1979) and Ayyad (1980) suggested that the productivity of epiphytons is dependent mainly on the growth of certain pinnate diatoms.

The number of green algal taxa was not high in almost all sites. There was an extensive growth of <u>Cladophora glomerata</u>, <u>Spirgyra varians</u>, <u>Oedogonium Capillformis</u>, <u>O. princeps and Ulothrix oscillarina</u>. This is in agreement with Kaleafah (1964) and Ayyad (1980).

Although the number of taxa belonging to cyanophyta is larger than that of chronophyta yet not a single taxon of cyanophyta was found common only in site No. 1, which means that the water sources from which the samples were taken are not the ideal habitat for the blue-green algae. This clear especially in samples of open water where cyanophyta are rare. This in agreement with Moor (1974).

As salinity is high in lake Qarun where <u>Phragmites australis</u> is dominant, only rare algae were recorded. Gran (1929), Patrick (1948) and Nasr <u>et al.</u> (1961) pointed out that the kind and distribution of algae is greatly affected by the change of salinity of water.

Extremely fast flowing water affected algal distribution. Under such condition only such alga as <u>Cladophora glomerata</u> may thrive being attached to stony substratum at kaabi barrage, site 8, this is in agreement with Lund (1965), who stated that fast flowing rivers may lack a true plankton, because there is insufficient time for the algae to produce effectively.

Round (1960, 1965), noticed that Chlorophyta occur in water with high ratio of alkali/Ca+Mg. The results obtained here are in agreement with this statement, thus <u>Cladophora glomerata</u> and <u>Spirogyra varians</u> were found abundant in the present study where values of Ca and Mg were high (Table 2).

The lack of planktonic or benthic algal flora in Silene spring habitat may be explained as the source of water is the ground deep water and thus the change for algal community development becomes little for this reason and also as water flow in the channel is so fast.

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Macrohydrophyte plant community	Typha domingensis Plirugmites Justralis	Leining gibba I'rain side plants:	salicornia tructicosa Cony 23 linifolia	Lemna gibba Phragmites australis Drain side plants:	Cyperus alternitolia Salicornia Iructicosa	Open water		Phragmites australis	Potamogeton nodosus lemna gibba	circimornia crassipes open water Canal side:	Polygonum salicifolium	Open water Stream side plant:	Cynodon dactylon Imperata cylindrica	Conyza Imilolia	Lemna gibba Thypha domingensis	
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0	Ŧ	Lake Qarun (saline water)	almost quiet	16°C (3:10 p.m.)	6.8	Phragmites australis Shore plants: Saliocornia fructicosa Avena fatue, Juncus sp.	σ	rare
=	:	South shore Lake Qarun (saline water)	Almost quiet	16°C (3:20 p.m.)	6.8	Shore plants: Salicornia fructicosa Cyperus alternifolius		
15	:	Lake Qarun east side (Saline water)	0.2 m/sec	16°C (3:30 p.m.)	6.8	Typha domingensis Shore plant: Juncus sp.	σ	

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Table (3). Cont	Alpal taxa	S. tabulata rostrata (J. Dannf.) A.Cl S. tabulata rupicola (Grun) A.Cl S. tabulata rupicola (Grun) A.Cl	Cocconeis placentula B euglypta (E.) Grun.	С. placentula genuina May С. placentula intermedia (Her. & Per.) Hust.	C. placentula lineata (E.) Cl. f. trilineata	C. thomasiana v. eiliptica brun Achnanthes aapajarvensis A.Cl	A. andicola (Cl.) Hust.	A. biasolettiana Jackii (Rabh.) A.Cl. A. hreviones angustata (Grev.) Cl.	A. brevipes B intermedia Kz.	A. brevipes parvula (Kz.) Cl.	A. delicatula (Kz.) Grun	A. hungarica Grun	A. Kriegeri krasske	A. lanceolata (Breb) Grun	A. lapponica genuina A.Cl	A. SChmidtlänä Krenner Dhoicosohonia curvata (Kz.) Grun	Diploneis bombus B minor Cl.	D. elliptica (Kz.) Cl. f. minor	Amphora angusta (Greg.) Cl. typica Cl. A. coffaeiformis B borealis (Kz.) Cl.	A. coffaciformis salina (W.Sm.) A.Cl.	A. libyca typica A.Cl	A. ovalis b gracilis (c.) Cl. A. pediculus B minor Grun	A. turgidula Grun.	Mastogloia Braunii Grun

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Table (3): Cont.		Algal taxa	Navicula avenacea Breb	N. cincta typica A.Cl	N. crucicula minor A. Cl.	N. cryptocephala genuina A. Cl.	N. cryptocephala B exilis Grun	N. cryptocephala subsalina Hust	N. cryptocephala veneta (Kz.) Cl	gotlandica B minor A.Cl	N. hungarica genuina A.Cl	pupula genuina Grun	pyginaea Kz.	N. radiosa kütz	rhyr	N. sumilis Krasske	N. viridula B capitata May	ouro	A. sculpta genuina A.CI	Stauroneis anceps leiostauron A.Cl	Punularia microstauron genuina O.M.	Nedium bisulcatum f. major A.Cl	mph	G. lanceolatum geninum A.Cl.	G. olivaceum tenellum (Kz.) Cl.	G. parvulum B exilissimum	G. parvulurn genuinum May	G. sphaerophorum E.	G. subclavatum Grun	rosig	G. distortum Win. Sin.	Amphipropra paludosa W.Sm.
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Table (3): Cont.	Samples No. Algal taxa	Epithemia sorex genuina A.Cl Rhopalodia gibba B ventricosa (Kz) O.M. R. gibberula constricata (W.Sm.) A.Cl Nitzschia acicularis W.Sm.	N. amphibia genuina May N. amphibia fossilis Grun N. apiculata (Greg.) Grun N. aquaca Wist & Por N. Calida Grun	N. Jonitcola genunia ACl. N. fonticola septentrionalis A.Cl. N. frustulum perminuta Grun N. fustulum B perpusilla (Rabh). Grun N. gracije typica A.Cl. N. hantzschiana genuina A.Cl. N. kutzingiana genuina A.Cl	N. kutzingiana minor n.v N. obtusa scalpelliformis Grun. N. palea genuna A.Cl. N. paradoxa (Gmel) Grun. N. pungen B atlantica Cl. N. sigma clausii (Htz) Grun	N. sigma f. miajor N. sigma genuina Grun N. sigma rigidula Grun N. socialis B baltica Grun N. stagnorum Rabh N. sublinearis Hust N. thermalis B intermedia Grun N. thermalis minor Hilse N. tryblionella debilis (Arn.) May

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Table (3): Cont.	Algal taxa	Nitzschla trybuoletta Schutte N. vitrea genuina Grun	Cymatopleura solea subconstricta O.M. 1. minor	S. ovata angusta (Kz.) A.Cl	S. ovata B minuta (Breb.) A.Cl.	S. ovata Smithil II. Nolli S. ovata typica (A.S.) A.Cl.	Division: Cyanophyta:	Anabaena flos-aquae (Lyngo.) breu.	CIRCOCCES INTERNO	C. tureidus (Kütz) Näg	Chroococcidiopsis thermalis Geitl.	Gloeocapsa arenaria (Hass) Rabenh	Lyngbia majuscula Harv.	L. martensiana Menegh	Mastigocladus laminosus Cohn	Microcoleus vaginatus (Vaucher) Gomont	Nodularia tenuis G.S. West	Nostoc lincka (Roth) Born. & Flan.	Nostochopsis lobatus wood	Oscillatoria ampnibla Ag. O limosa Ag	O. IIIIIOSA AG.	O. Sancta (Kütz.) Gomont	O. Subtilissima Kütz	O. tenuis Ag. Phormidium tenue (Menegh.) Gomont.	Pseudanabaena galeata Böcher Rhabdoderma lineare Schmidle & Lauterb.
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Table (3): Cont.	Algal taxa	Schizothrix arenaria (Berkeley) Gomont	S. calcicola (Agardh) Gomont	Spirulina fusiformis Woronich	S. subsalsa Oersted	Division: Chlorophyta:	Characium acuminatum A. braun ex Kuetzing	Cladophora glomerata (L.) Kütz	C. vadorum (Areschoug) Kütz	Chlorococcum humicolum (Naeg) Rabenh	C. infusionum (Schrank) Meneghini	Coleochaeta divergens Pringsheim	Oedogonium capilliforme Kütz	O. princeps (Hass) Wittr	Pandorina Sp.	Scenedesmus bijugatus (Turpin) Kuetzing	S. quadricauda (Turp.) Brép	Sphaeroplea africana Fritsch	Spirogyra varians (Hass) Kütz	Trichophilus welckeri Weber von Bosse	Ulothrix oscillariana Kütz	(J. zonata (Weber et Mohr)	Division: Euglenophyta:	Protoeuglena noctilucae		

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#### References

- Abou El-Kheir, W.S., El-Saadawi, W.E. and Darwish, M.H., 1986. A peculiar Algal-Moss association from El-Giza, Egypt. Arab. Gulf. J. Scient. Res. 4:69-75.
- Aleem, A.A., 1958. A taxonomic and Paleoecological investigation of the diatom flora of the extinct Fayum (Lake-Upper Egypt). Bull. Fac. Sci. Alex. Univ. 2: 99-217.
- Ayyad, S.M., 1980. Ecological studies on the Epiphytic algae inhabiting some Hydro-Macrophytes on Mansoura-Damieta area. M.Sc. Thesis Mansoura Univ. Egypt.

Chapman, V.J., 1964. The algae. Macmillan, London.

- El-Saadawi, W.E. and Abou El-Kheir, W.S. 1973. On some Egyption Mosses and the algal flora in their habitats. Proc. Egypt. Acad. Sci. 26:125-136.
- El-Saadawi, W.E., Badawi, A.A., Shaaban A.A. and El-Awamri, A.A., 1978. Pleistocene Diatoms from El-Fayum. Proc. Egypt. Acad. Sci. 31:257-263.
- El-Saadawi, W.E., Abou El-Kheir, W.S. and Darwish, M.H. 1986. Micropoma niloticum (Del.) Lindb. (Musci) with Corm-Like stem bases. Phytologia 60:98-100.
- Ewinson, 1978. Cited from Ayyad, S.M., 1980: Ecological studies on the epiphytic algae inhabiting some hydro-macrophytes on Mansoura-Damietta area. M.Sc. Thesis Mansoura Univ., Egypt.
- Fritsch. F.E., 1959, 1961. The structure and reproduction of algae. Vols.I., II Cambridge Univ. Press.
- Gran, H.H. 1929. Investigation of the production of plankton outside the Romsdalsfjord 1926-1927. Perm, Int. Explor. Mer, Rapper Proc. Verb. 26(6) 1-112.
- Kaleafah, A.F., 1964. Ecology of algae in Lake Mariut. M.Sc. Thesis Fac. Sci. Alex. Univ.
- Lund, J.W.G., 1965. The ecology of the fresh water phytoplankton. Biol. Rev. 40:231-293.
- Marker, A.F. and Gunn R.J.M. 1977. The benthic algae of some streams in southern England. III-Seasonal variations in Chlorophyll a in the seston. J. Ecol. 65(1): 223-234.

- Moor, J.W., 1974. Benthic algae of Southern Baffin Island. III. Epilithic and epiphytic communities. J. Phycol. 10(4): 461-462.
- algae in 21 lakes and streams in the North West Territories. Can. J. Bot. 57:568-577.
- Nasr, A.H., Hashim, M.A. and Aleem. A.A., 1961. The flora of Lake Edku, with particular reference to benthic diatoms. Bull. Fac. U.A.R.5: 219-234.
- Nosseir, M.A. and Abou el-Kheir, W.S., 1970. Effect of dissolved nutrients on the distribution of algal flora in selected lakes of U.A.R. I-lake Qarun. Ann. Rev. Univ. Coll. for Girls, Ain Shams Univ., U.A.R. No. 6, 15-24.
- Patrick, R., 1948. Factors affecting the distribution of diatoms. Bot. Rev. 14(8): 473-524.
- Prescott, G.W., 1969. The algae: A review. New York.
- Prowse, G.A., 1959. Relationship between epiphytic algal species and their macrophyte hosts. Nature, Lond. 183, 1204-5.
- Richardson, D.H.S., 1981. The Biology of Mosses. Blackwell Scientific Publ., Oxford.
- Rivera, P.R. 1973. Epiphytic diatoms on <u>Gracillaria Verrucosa</u> (Hudson) papenfuss collected along the Chileau Coast. Gayana Bot. 25:3-115.
- Round, E.F., 1960. Studies on Bottom-Living algae in some lackes of the English Lake. District Part IV. The Seasonal Cycle of the Bacillariophyleoc. J. Ecol. 48:529-547.
- Round, E.F. and Happy, C.M. 1965. Persistant, vertical migration rhyths in benthic microflora. IV. A diural rhythm of the epipelic diatom association in non-ridal flowing water. Brit. Phycol. Bull. 2, 463.
- Shaaban, A.S., and Badawi, A.A. and El-Awamri, A.A., 1985. Studies on the diatom of Bahr-Youssef irrigation canal and its branches in El-Fayum depression, (A.R.E.) Moshtohor, Annals of Agricultural Science, Vol. 24 (in press).
- Sheldon, R.B. and Charles, W.B. 1975. Factors affecting the contribution by epiphytic algae to the primary productivity of an oligotrophic fresh water lake. Appl. Micro 30(4): 567-667.
- West, W., 1909. The algae of Bircet Qarun, Egypt. J. Bot. Vol. 47,1.

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